

# IOT Based Seed Sowing Robot for Modern Agriculture

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**Abstract—** This project involves the development of an automated seed sowing robot designed to improve planting efficiency and accuracy in agricultural fields. The robot moves along crop rows and dispenses seeds at precise intervals and depths using a seed dispenser mechanism controlled by a microcontroller. This eliminates the need for manual planting, reduces labor costs, and ensures uniform seed distribution, which leads to better germination rates and crop yields. The system is particularly beneficial for small farmers and can be adapted for various crop types.

## INTRODUCTION

Agriculture is one of the most important sectors that supports food production and economic growth. Traditional farming methods mainly depend on manual labor and conventional tools, which require more time and effort. With the increasing demand for food, modern agriculture is adopting automation technologies to improve efficiency and productivity. Seed sowing is a crucial farming operation that directly affects crop growth and yield. Manual seed sowing often results in uneven spacing, improper depth, and seed wastage. To overcome these problems, the Seed Sowing Robot for Modern Agriculture has been developed. The robot is designed to sow seeds automatically with high accuracy and minimum human intervention. It uses a microcontroller, DC motors, motor driver, ultrasonic sensor, and seed dispensing mechanism for operation. The robot moves through the field and places seeds at predefined intervals and depths. The ultrasonic sensor helps detect obstacles and ensures safe navigation. Automated seed sowing reduces labor requirements and operational costs. It also minimizes seed wastage and improves planting accuracy. Proper seed placement ensures better germination and healthy

crop growth. It provides a cost-effective solution for farmers and helps overcome labor shortages. The seed sowing robot contributes to smart farming and sustainable agricultural development. Future enhancements can include IoT, GPS, and AI technologies for advanced agricultural automation.

## I. LITERATURE SURVEY

Much of the research and work has been done In the field of SEED SOWING ROBOT FOR MODERN AGRICULTURE

### A. Taneja and S. Dutta (2020)

In their paper titled “Solar Powered IoT-Based Agricultural Vehicle for Sowing, Spraying and Grass Cutting”, the authors developed a solar-powered agricultural robot capable of performing multiple farming operations such as seed sowing, spraying, and grass cutting. The system uses IoT technology for smart monitoring and control. The proposed robot improves energy efficiency through solar power utilization and supports sustainable farming practices while reducing operational costs.

### C. Cheng et al. (2023)

In the paper “Recent Advancements in Agriculture Robots: Benefits and Challenges”, the authors reviewed modern agricultural robots and their applications in farming activities such as sowing, harvesting, spraying, and crop monitoring. The study highlighted the benefits of automation, including increased productivity, precision farming, and reduced labor dependency, while also discussing challenges related to navigation, maintenance, and environmental conditions.

### 3. H. Nguyen, A. La, and B. Pham (2023)

The paper “Real-Time Weed Detection Using YOLOv5 for Smart Agricultural Robots” presented a machine learning-based agricultural robot capable of detecting weeds using computer vision techniques. The system uses the YOLOv5 algorithm for real-time object detection, demonstrating the importance of Artificial Intelligence in precision agriculture and smart farming applications.

### Vijay K. Pandey, Vijay Kumar Gupta, and Tanuja Sheorey (2025)

In the paper “Development of Agri-Bot for Seed Sowing Automation”, the authors designed a low-cost agricultural robot for automating the seed sowing process. The system focuses on improving seed placement accuracy, reducing seed wastage, and minimizing human effort. The proposed solution is particularly beneficial for small-scale farmers and supports precision agriculture practices.

## II. EXISTING SYSTEM

The existing seed sowing system mainly uses manual labor and simple farming tools. It requires more time, effort, and manpower for sowing operations. Manual sowing often results in uneven seed distribution and improper spacing. Seed wastage is high, which reduces farming efficiency and productivity. Therefore, traditional seed sowing methods lack accuracy, automation, and cost-effectiveness

## III. PROPOSED SYSTEM

The proposed system is an automated Seed Sowing Robot designed to improve the efficiency and accuracy of agricultural sowing operations. The robot moves through the field and places seeds into the soil automatically at predefined intervals. It uses a microcontroller, motors, sensors, and a seed dispensing mechanism to perform sowing with minimum human intervention. The system reduces labor requirements, minimizes seed wastage, and ensures uniform seed placement. Thus, it improves agricultural productivity and supports precision farming.

## IV. METHODOLOGY

The methodology of the proposed Seed Sowing Robot starts with analyzing the limitations of traditional seed sowing methods. The system is designed to automate the sowing process and improve efficiency. A microcontroller acts as the main control unit of the robot. DC motors are used for movement across the field. The motor driver controls the speed and direction of the motors. A seed dispensing mechanism releases seeds at predefined intervals. An ultrasonic sensor detects obstacles during operation. The robot moves automatically with minimum human intervention. Proper synchronization ensures accurate seed placement and spacing. The system reduces seed wastage and labor requirements. The robot is tested for reliable performance under field conditions. Thus, the methodology improves agricultural productivity through precision farming.

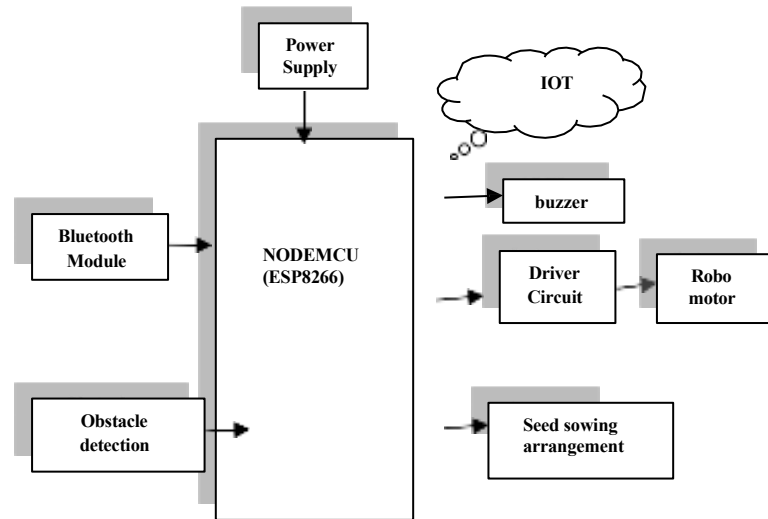


FIG 1 Block diagram of Seed Sowing robot for modern agriculture

## Applications

The Seed Sowing Robot is widely used in modern agriculture for automating the seed sowing process. It helps farmers reduce manual labor and physical effort during farming operations. The system ensures uniform seed placement with proper spacing and depth, which improves crop growth and productivity. It minimizes seed wastage and increases resource utilization efficiency. The robot supports precision farming and smart agriculture practices by improving accuracy and operational efficiency. It can be used in both small-scale and large-scale agricultural fields to achieve better farming results.

## V. HARDWARE DETAILS

### POWER SUPPLY

The power supply section is the section which provide +12V for the motor driver to work. IC L298N is used as motor driver

DC motors are used for the movement of the wheels and low rpm motor is used for seed dispensing mechanism

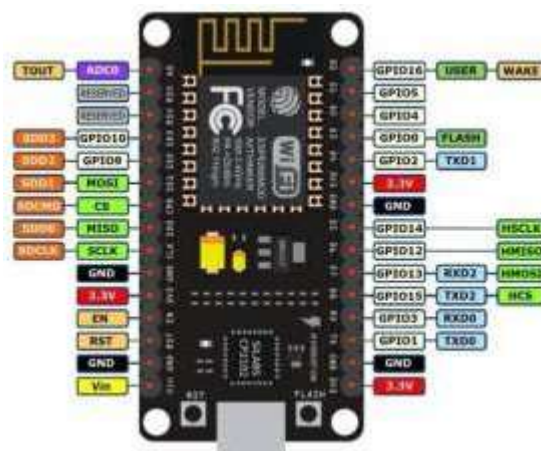
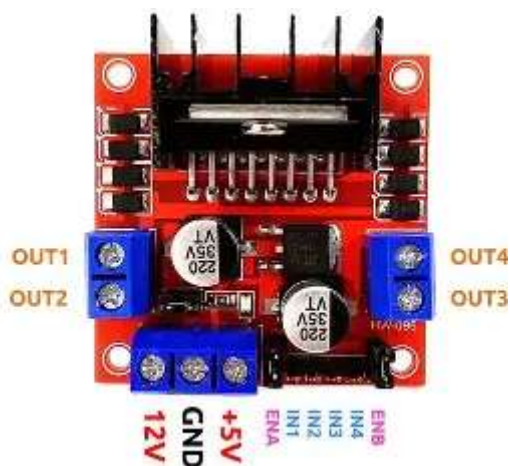
### DC MOTOR

DC motors are used to provide movement to the Seed Sowing Robot. They convert electrical energy into mechanical energy. The motors help the robot move forward, backward, left, and right in the field. The proposed system uses 12V, 100 RPM geared DC motors for smooth operation. These motors provide high torque and efficient movement during seed sowing.



## L298N

The L298N Motor Driver Module is used to control the movement of DC motors in the Seed Sowing Robot. It acts as an interface between the microcontroller and the motors. The module receives control signals from the controller and supplies the required power to the motors. It is based on H-Bridge technology, which allows the motors to rotate in both directions. This enables forward, backward, left, and right movement of the robot. The module also supports speed control using PWM signals. It can control two DC motors simultaneously. The L298N ensures smooth and efficient motor operation. It improves the robot's navigation and overall performance.



### Driver Circuit:

L293D IC generally comes as a standard 16-pin DIP (dual-in line package). This motor driver IC can simultaneously control two small motors in either direction; forward and reverse with just 4 microcontroller pins (if you do not use enable pins).



## MICROCONTROLLER

The ESP8266 is a low-cost, Wi-Fi-enabled microcontroller widely used in IoT applications for its built-in wireless networking capability and compact design. Featuring a 32-bit RISC processor (Xtensa LX106) operating at 80 MHz, it supports protocols like UART, SPI, I2C, and PWM through its GPIO pins. The popular NodeMCU development board, based on the ESP8266, includes USB support, flash memory, and user-friendly pin headers, making it ideal for rapid prototyping. Compatible with the Arduino IDE, it allows developers to create smart, energy-efficient devices for automation, remote sensing, and wireless control systems without requiring separate Communications module.

### Bluetooth module:

A Bluetooth module is a compact and versatile hardware component used for enabling wireless communication between devices over short distances. It operates using Bluetooth technology, which is based on radio frequency (RF) communication in the 2.4 GHz ISM band. these modules Are hidden engines behind everyday smart devices ,fitness trackers, and custom robotics proje

## BUZZER

A buzzer or beeper is a signaling device, usually electronic, typically used in automobiles, house hold appliances such as a microwave oven, or game shows.

It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound.



## VI. SOFTWARE DETAILS

### THE ARDUINO INTEGRATED DEVELOPMENT ENVIRONMENT

Arduino Integrated Development Environment (IDE) is an open-source software platform used to write, edit, compile, and upload programs to Arduino boards. It provides a simple and user-friendly interface, making it suitable for both beginners and experienced developers. The IDE supports programming in C and C++ languages and includes a built-in code editor, compiler, and serial monitor. It allows users to verify programs, detect errors, and upload code directly to the microcontroller. Arduino IDE also supports various libraries that help in interfacing with sensors, motors, displays, and communication modules. It is compatible with Windows, Linux, and macOS operating systems and is widely used for developing embedded systems, robotics, automation, and Internet of Things (IoT) applications.

## VII. CONCLUSION

Robotics is playing a growing role in everyday life as engineers work to automate tasks that are repetitive, physically demanding, or hazardous. While industrial settings remain the primary area of use, robots are also becoming more common in service sectors and even in households. As robotic systems evolve, they rely not only on advanced hardware but also on complex software, which is essential for enabling autonomous operation..

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